

STAT

Page Denied

STAT

SOVIET SCIENTIFIC AND TECHNICAL CONFERENCE ON PIEZOELECTRICITY

Elektrichestvo, No 6, pp 85-86
Moscow, Jun 1953

Engr P. G. Pozdnyakov
Engr I. S. Zheludev

The All-Union Scientific and Technical Conference on Piezoelectricity, organized by the Department of Physicomathematical Sciences, Academy of Sciences USSR, was held from 25 to 29 November 1952 in Moscow at the Institute of Crystallography, Academy of Sciences USSR.

Participating in the conference were various organizations of the Academy of Sciences and other departments, whose representatives delivered more than 30 communications. More than 100 representatives of different enterprises and organizations were present. During the conference an exhibit of almost all the native published work on theory and practical applications of piezoelectricity was organized. This was the first all-Union conference on piezoelectricity covering its diversified applications.

The conference was opened by A. V. Shubnikov, president of the Organization Committee, director of the Institute of Crystallography, and Corresponding Member of the Academy of Sciences USSR, who commented on the history of the development of piezoelectric studies and noted the great contributions made in this field by Russian and, especially, Soviet scientists and engineers.

N. N. Andreyev, Corresponding Member, Academy of Sciences USSR, delivered a paper "General Comments on the Theory of Transducers." Touching on the progress of Soviet science in the field of the theory of transducers, Andreyev examined the thermodynamic theory of transducers, particularly of the crystal type, in a general manner, demonstrating with a series of examples how a number of partial problems can be solved on the basis of this theory.

Andreyev also treated the problem of how most conveniently to describe oscillations in electromechanical [transducer] systems. He remarked that the method of electromechanical analogies, which yields satisfactory results in the solution of engineering problems, does not fully describe processes. He considers the wave point of view the most convenient approach for mapping physical processes.

The conference heard a number of papers devoted to theoretical and experimental investigations of ferroelectric and piezoelectric properties of barium titanate and other materials with lattices of the perovskite type.

G. A. Smolenskiy, Candidate of Technical Sciences (Institute of Silicate Chemistry, Academy of Sciences USSR), delivered a report devoted to a description of the ferroelectric properties of certain solid solutions. This research has made it possible to obtain ceramic ferroelectric materials with both small and large ratios of dielectric constant to field strength, and this is of great practical interest.

The paper "Toward a Microscopic Theory of the Dielectric Properties of Barium Titanate" was read by A. Ye. Glauberman (L'vov State University). The proposed theory has made it possible to obtain values of the index of refraction and the dielectric constant of barium titanate which are close to those found experimentally.

A paper "Elastic and Piezoelectric Parameters of the Ceramic Barium Titanate" was read by L. K. Zarembo, aspirant, Chair of Acoustics of the Physics Faculty of Moscow State University.

I. S. Zheludev, Scientific Associate of the Institute of Crystallography, Academy of Sciences USSR, delivered a report entitled "Piezoelectric Transducer for Measuring Pressures and Forces in Periodically Acting Mechanisms" which demonstrated designs of

STAT

piezoelectric transducers for a peat-briquette press and a control-measuring instrument (PID-2) for measuring deformations and forces in periodically acting mechanisms (presses, etc.).

The conference heard two papers on investigations of the properties of Rochelle salts.

K. Goncharov, aspirant in the Chair of Acoustics of the Physics Faculty of Moscow State University, read a paper entitled "Permanent Rochelle Salts and Their Dimensions."

Scientific Associate V. P. Konstantinova of the Institute of Crystallography, Academy of Sciences USSR, gave a report on the growth and physical properties of Rochelle salts. He stated that the introduction of admixtures of the ions of certain elements into a Rochelle-salt solution during the growth of a monocrystal has a strong effect on the relationship between the speeds of growth of different grains and on the monocrystal's dielectric properties.

A. V. Shubnikov, Corresponding Member, Academy of Sciences USSR, delivered a report "Problem of the Polarization of Dielectrics." At the request of participants, Shubnikov demonstrated interesting experiments on crystallizing salol and cholesterol acetate. These experiments clearly showed the dependence of the shapes of the crystals on the degree of supercooling, the separation of the centers of crystallization from matter already crystallized when there was crystallization of salol, the oriented growth of salol crystals (acicular crystallization), and the crystallization of spherulites of cholesterol acetate.

V. A. Koptsik, aspirant at Moscow State University, presented two communications on research conducted at the Institute of Crystallography, Academy of Sciences USSR.

The first communications, "Piezoelectricity and Crystal Symmetry," showed that the sufficient condition for the existence of a piezoelectric effect on dielectric crystals is the existence of strong (permanent or induced) dipoles in the crystal structure, provided that these dipoles are favorably distributed with respect to one another according to the rules of selected special groups of symmetry. He told of the catalogue he had compiled on potentially piezoelectric substances and substances in which the piezo effect is observed. The catalogue lists over 1,600 items.

Koptsik's second communication, "Investigation of the Electrical and Elastic Properties of Resorcin Crystals," revealed the results of an experimental investigation of a new piezoelectric substance selected on the basis of the criteria for symmetry established by the author. The new piezoelectric, with a maximum piezoelectric constant $d_{24} = 55 \times 10^{-8}$ electrostatic units, stands in third place among quantitatively investigated piezoelectric crystals and is the strongest pyroelectric crystal.

P. G. Pozdnyakov opened a series of papers on the growth and utilization of synthetic piezoelectric crystals with his communication "The Growth of Potassium Tartrate Crystals." He treated in detail their growth characteristics and techniques for growing them, especially a new isothermic growing method which he proposed and a new design for crystallization apparatus.

Ye. G. Bronnikova, Candidate of Technical Sciences, TsNILP /Central Scientific Research Laboratory of Piezoelectricity?, in his communication "Piezoelectric Resonators of New Synthetically Grown Crystals" treated in detail the electrical characteristics of resonators from the following artificial crystals: ammonium phosphate (PA); ethylenediamine tartrate (EDV); and potassium tartrate (KV). Cited were detailed characteristics of resonators for filters of 12-channel high-frequency telephone apparatus as well as ammonium phosphate crystal resonators for the low audio frequencies used in filters of multichannel apparatus for remote control and telemetering of power systems.

STAT

Engineer P. G. Pozdnyakov in a report "Piezoelectric Resonators From Synthetic Crystals" touched on the history of this work, which was conducted under his leadership at TsNILP of MESEP (Ministry of Electric Power Stations and the Electrical Industry) from 1947 to 1952. He described in detail the design and production of resonators. In conclusion Pozdnyakov referred to the practical results of the work, namely, production of experimental lots of filters for 12-channel high-frequency communications apparatus. These filters operated successfully for more than a year on USSR communications trunk lines.

E. V. Zelyakh, Doctor of Technical Sciences, contributed a communication entitled "Development of Electric Filters With Synthetic Crystal Resonators for 12-Channel High-Frequency Telephone Systems." This work was done jointly with Ya. I. Velikin. The communication related in detail how the problem of replacing quartz resonators with cheaper and more available synthetic potassium tartrate crystals was solved.

The communication of Engineer A. A. Voronkov (TsNILP), "Precision Optical Method for Orienting Crystal Cuts," described the results of X-ray investigations of potassium tartrate crystals using an X-ray goniometer for orientation of quartz plates and also plates of potassium tartrate crystal. An improved polarization method and instrument for orientation of crystal plates was described and a comparison with the X-ray orientation method given.

The communication of Engineer G. M. Kurtev (TsNILP), "Universal Phonograph Pick-Ups With New Piezoelectrics," cited detailed data on high-quality pick-ups with ammonium phosphate and barium titanate for reproducing both standard and long-playing phonograph records.

F. P. Alekseykin (L'vov State University) reported on "Dependence of the Conductivity of Ammonium Phosphate Crystals on the Presence of Admixtures." He communicated experimental results of research on the dependence of the volumetric conductivity of ammonium phosphate crystals on admixtures which have been introduced into the solution during growth of the crystals.

The conference adopted a resolution pertaining to the direction of further research on piezoelectricity. The participants expressed a desire to hold a similar conference annually.

- E N D -

STAT